NOTES AND NEWS

NECTAR-SUGARS AND POLLINATOR TYPES IN CALIFORNIA *Trichostema* (LABIATAE).—The relative proportions of glucose, fructose, and sucrose in nectar vary, with either the monosaccharides or disaccharide predominating (Percival, New Phytol. 60:235–281. 1961). The three sugars contain about an equal number of calories per gram (Stiles, Ecology 56:285–301. 1975). Energy costs in the formation of saccharide bonds may select against the use of oligosaccharides but this may be counterbalanced by pollinator preferences. For example, hummingbirds prefer sucrose-rich nectar (Stiles, Condor 78:10–26. 1976) and in a survey of hummingbird-pollinated species, Baker and Baker (Phytochem. Bull. 12:43–45. 1979) found sucrose-rich nectar to prevail.

In this note, data on nectar sugars and pollinator types are presented for five California species of *Trichostema*. Populations were sampled in the following areas: *T. lanatum* (Santa Monica Mountains); *T. lanceolatum* and *T. ovatum* (Central Valley); *T. laxum* (North Coast Range) and *T. parishii* (San Gabriel Mountains). More specific locations and a description of pollination mechanisms and nectar production are found elsewhere (Spira, M.A. thesis, Calif. State Univ., Chico. 1978; Spira, Amer. J. Bot. 67:278–284. 1980). Nectar samples were collected and analyzed using techniques described in Baker and Baker (op. cit.).

The hummingbird-pollinated *Trichostema lanatum* has sucrose-dominant nectar (1.08 sucrose:1 glucose + fructose) while bee-pollinated *T. lanceolatum* (0.43:1), *T. ovatum* (0.43:1) and *T. laxum* (0.25:1) have glucose-fructose dominant nectars. Both hummingbird pollination (Moldenke, *In*: Thrower and Bradbury, eds., Chile-Calif. Medit. scrub atlas. 1977) and insect pollination (Spira, 1980, op. cit.) occur in *T. parishii,* which has a sucrose-dominant nectar (1.24:1). These data provide additional evidence that a tendency toward sucrose-dominant nectars is associated with hummingbird pollination, in spite of the increased cost in producing it.

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WALNUT POLLEN IN LATE-HOLOCENE SEDIMENTS OF THE SACRAMENTO-SAN JOAQUIN DELTA, CALIFORNIA.—Thompson (Madroño 17:1–10. 1963) has reviewed the origin and distribution of *Juglans hindsii* Jepson in central California, has noted the paucity of fossil material of Pleistocene-Holocene age, and has suggested (p. 8) that "verification of Pleistocene remains, perhaps through fossil walnut pollens from the San Joaquin Delta peats, would greatly reinforce our understanding of pre-Holocene distribution." While it is now known, based on radiocarbon-dated peats and peaty mucks, that the modern Delta is post-Pleistocene (Shlemon and Begg, *In*: Suggate and Cresswell, eds., Quaternary studies. 1975), the presence of walnut pollen within Delta sediments still is significant, because it adds to the known areal distribution of walnut in central California a temporal dimension extending back 5000–6000 years.

As part of a paleo-environmental study of the Delta supported by the California Department of Water Resources (West, report on file, Calif. Dept. Parks Rec. 1977), cores were collected from Clifton Court and Roberts Island in the southeast corner of the Delta. Both cores provided discontinuous pollen records from more than 4300 radiocarbon years ago. In the Clifton Court core, walnut pollen is present in small amounts (<1 percent) in four samples, one from immediately below a peaty muck dated to 2950 ± 150 B.P. (GX 4221) and the others from 2, 8, and 10 cm below the lowest dated peaty muck (4340 ± 150 B.P.; GX 4223). In the Roberts Island core, *Juglans* pollen is present only in the uppermost of the prehistoric peat layers and in each of the overlying historic age samples. The Roberts Island core samples have not been dated by radiocarbon methods but the sediments, stratigraphy, and pollen spectra are similar to those of the Clifton Court core and are assumed to be of an equivalent age. Some of the